
The Hepatitis B Immunization Campaign for Children in the Federated States of Micronesia

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Technical consultation for the campaign was provided by the Centers for Disease Control, National Center for Infectious Diseases, Division of Viral Diseases, Hepatitis Branch, through the Pacific Islands Health Officers Association.

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Synopsis

Hepatitis B has long been recognized as hyperendemic among persons residing in the western Pa-

cific. Effective control strategies have not been described. From December 1988 through October 1989, the Federated States of Micronesia (FSM) conducted a campaign to immunize children through age 6 years with three doses of hepatitis B (HB) vaccine. In addition, HB vaccination was incorporated into the routine immunization schedule for all children born in FSM, with the first dose given to newborns.

Between December 1988 and October 1989, a total of 64,085 doses of HB vaccine were administered to the children. After the start of the campaign, the subject group was enlarged to include children through 15 years of age in the States of Yap and Kosrae. Fifty-nine percent of the enlarged group in all States received a complete series of HB vaccinations. During each client encounter, individual immunization records were examined and diphtheria-pertussis-tetanus, oral polio vaccine, and measles-mumps-rubella antigens were administered to children who were not adequately immunized. The annual immunization assessment for 1990 showed coverage improved significantly from previous years in every FSM State.

IN OCEANIA, an estimated 2 to 20 percent of the population carry the hepatitis B virus (HBV). About 40 to 90 percent of infections acquired in infancy and childhood lead to the chronic carrier state, with 25 percent of carriers progressing to chronic liver disease, cirrhosis, and liver cancer (1).

In the United States, HBV usually is transmitted through sexual activity. In Oceania, however, transmission occurs primarily in infancy and childhood. One method of transmission is from a hepatitis B (HB) surface antigen positive woman to her infant during birth. Another method is between young children, probably by serum exchange through open skin lesions, which are common in the tropics (1, 2). The incidence of HBV infection in areas of the Pacific has been described (2-4). Serologic marker positivity ranges from 22 percent in Kapingamarangi, in the Federated States of Micronesia (FSM), to 98 percent in Kiribati, formerly the Gilbert Islands.

A plasma-derived hepatitis B vaccine was licensed in June 1982. In 1985 the Centers for Disease Control (CDC) began a project designed to demonstrate the effects of HBV control in an entire population. Public health officials in the Pacific area participating in the project chose American Samoa as a project site because its public health, laboratory, and outreach infrastructure were believed to be capable of supporting an all-out hepatitis B (HB) elimination campaign.

By June of 1988, 98 percent of the population had been serotested, 70 percent of the susceptibles were immunized, and about 3,800 newborns had been vaccinated. The project coordinators estimated a savings of about \$13 million in future health care and work loss costs resulting from the project's impact on reduction of acute HBV cases and chronic liver disease. The HB immunization of newborns is continuing in American Samoa (personal communication, Gary C. Schatz, PhD, Cen-

ters for Disease Control, Center for Infectious Diseases, Division of Viral Diseases, May 1991).

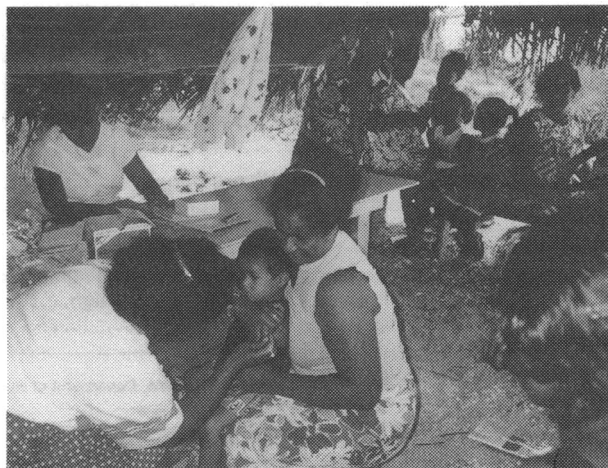
In 1988, following the success of the Samoa project, CDC obtained 100,000 doses of HB vaccine donated by the manufacturer, Merck Sharp and Dohme, Co., for use in a campaign to immunize infants and children in other high incidence areas of the United States-associated Pacific islands, including the Federated States of Micronesia (FSM), Guam, Commonwealth of the Northern Marianas, Marshall Islands, and Palau. The campaign was promoted through the collaborative efforts of CDC, the U.S. Department of the Interior, the University of Hawaii School of Public Health, the Pacific Islands Health Officers Association, and the U.S. Public Health Service (PHS) Regional Health Administrator for Region IX (5). The campaign was supported by policy makers, health care providers, and the public in the various jurisdictions. We report on the administration and success of the HBV campaign carried out in FSM.

Materials and Methods

FSM is a newly independent nation that consists of more than a thousand small islands (formerly known as the Caroline Islands), located in the western Pacific. The four FSM States of Yap, Chuuk, Pohnpei, and Kosrae extend for about 1,400 miles in the west central Pacific and have a total population of about 104,000 (6). Until 1978, FSM was part of the U.S.-administered Trust Territory of the Pacific Islands. A Compact of Free Association negotiated in 1982 provided for U.S. financial support that diminishes during a 15-year period.

In addition to Compact funds, support for health services comes from PHS grants (7). Health services are delivered through the administration of a public hospital and health department in each State. Both elements are assisted by a department of the national government. There are no private physicians practicing in FSM.

Table 1 gives geographic, demographic, and health service data. About 45 percent of the FSM population is younger than 15 years, and 55 percent is younger than 20 years. The annual population growth rate is 3 percent (6). The large proportion of young persons, including many women of child-bearing age, combined with a high population growth rate and geographic isolation, creates problems for maintaining adequate immunization coverage and particularly for hepatitis B control.



Public health nurses conduct a hepatitis B immunization clinic for children on Kapingamarangi atoll in the Federated States of Micronesia in 1989. Lois Santos injects a patient as Hermine Henry checks patient records. (Photo by Sally Jo Manea)

During the assessment phase of the FSM hepatitis B vaccination campaign in 1989, Frank Mahoney and coworkers of the Chuuk State Department of Health Services conducted a seroprevalence survey among randomly selected children ages 3 to 6 years in 13 villages of the lagoon and outer islands of the State of Chuuk. Results showed that 55 percent of these children had evidence of current or prior HBV infection. A smaller survey of 100 women attending a prenatal clinic indicated a 10 percent chronic carrier rate (personal communication, Frank Mahoney, MD, now with Centers for Disease Control, National Center for Infectious Diseases, Hepatitis Branch, August 24, 1989).

Immunization scheduling. Because of the reported gains from the Samoa project and the alarming rates of HBV infection among young children in FSM, health officials decided on campaign objectives to incorporate HB vaccination into the existing World Health Organization (WHO) Expanded Program on Immunization (EPI) schedule for infants. Additionally, children younger than 7 years were to be immunized with three doses of HB vaccine. As a condition of participation, the FSM Government would immunize newborns after the campaign (8).

The vaccine schedule for all States was changed to incorporate HB vaccination into the EPI and to accelerate the schedule to complete the primary series of diphtheria-pertussis-tetanus (DPT), oral

Table 1. Geographic and demographic factors and resources affecting service delivery in the Federated States of Micronesia hepatitis B childhood immunization campaign, by State, 1988–89

Characteristic	Chuuk	Kosrae	Pohnpei	Yap
Total population ¹	52,907	6,838	31,737	12,531
Estimated 1989 intended immunization group, birth to 6 years ¹	12,090	1,694	7,589	2,275
Number of inhabited lagoon islands	20	1	2	1
Number of inhabited outer islands	30	0	7	15
Distance in miles by ship from capital to outermost island	220	0	440	580
Number of field dispensaries having a full-time or half-time health assistant ..	57	0	7	25
Number of public health nurses assisting the campaign	16	8	14	7
Number of clients per nurse	756	212	542	325

¹ Information provided by the Federated States of Micronesia, Department of Human Resources, Office of Health Statistics, based on the most recent State census.

polio vaccine (OPV), and measles-mumps-rubella (MMR) by age 12 months. The immunization schedule implemented at the onset of the campaign is shown. An exception was the schedule for Yap, where the fourth dose of DPT-OPV and the MMR dose were given at 15 months of age rather than 12 months. For Chuuk only, *Bacillus Calmette-Guerin* (BCG) vaccine was given for tuberculosis protection.

Age	Vaccine			
Birth	HB	...	...	(BCG, Chuuk)
2 months	HB	DPT	OPV	...
4 months .....	...	DPT	OPV	...
6 months	HB	DPT	OPV	...
12 months .....	...	DPT	OPV	MMR
4–6 years .....	...	DPT	OPV	...

The schedule for HB vaccination for children from 1 to 15 years called for the second dose 2 months after the first, and the third dose 4 to 6 months after the second. The schedule for Chuuk, Kosrae, and Pohnpei was 10 micrograms (0.25 ml) from birth to 6 years. The schedule for Yap was 10 micrograms from birth to 1 year, and 5 micrograms (0.125 ml) for those older than 1 year.

Campaign support. Important contributions to the campaign were made by the Governments of Hawaii and Guam. The Governor's Pacific Health Promotion and Development Center in Hawaii provided funds to purchase syringes and served as recipient and transshipment agency for the donated vaccine. The center also provided funding for staff members to visit the jurisdictions prior to the campaign to establish logistics for receiving the vaccine (5). The Pacific Basin Maternal-Child Health Resource Center, on Guam, provided participating States with culturally appropriate educational materials translated into local languages. In FSM, vaccinations traditionally are given by public health

nurses operating from centrally located clinics in each State. Funds for vaccines have been provided by PHS and CDC.

A factor that influenced Chuuk's ability to incorporate HB vaccine into its existing immunization schedule efficiently was a Special Projects of Regional and National Significance (SPRANS) grant in 1987, grant MCJ-753881 from the PHS, Health Resources and Services Administration, Maternal and Child Health Branch. A primary focus of that project was to improve immunization levels. The grant provided funds for staff salary, supplies, boat rental and fuel, equipment, and communications before and during the HB campaign. Plans and commitment of local resources for expanded immunization services were already in place when the donated vaccine arrived.

Campaign administration. Primary health care (PHC) had been adopted as official public policy in all the States before the HB campaign. The stage of development of the PHC village dispensary-health assistant infrastructure was another factor that affected each State's ability to administer HBV in these isolated areas. Differences in resources and infrastructure among the four FSM States affected service delivery in the villages. With the exception of Kosrae, all States carried out the entire 10-month campaign without hiring extra staff or paying overtime rates.

In 1985, the Government of Yap continued its efforts to strengthen primary health care by creating a fully funded branch of the Department of Health Services with permanent staff, establishing communications systems for a network of field dispensaries, and providing programs to train health assistants in dispensary management. Yap chose to focus attention on specific areas, one of which was immunization. As a result, recording and reporting systems were well established and immunization levels had risen by the time the HB

campaign started. Yap's dispensaries were already staffed with trained health assistants who managed immunization clinics for village children. Thus, addition of a new antigen to the routine immunization schedule was accomplished within a familiar framework.

In all States, staff members frequently left central facilities early in the morning and returned after dark. To visit some lagoons or outer islands, teams spent several continuous days in the field. To reach remote outer islands, field trip teams spent up to 3 weeks moving among islands by ship.

The Public Health Nurses (PHN) who were immunization program coordinators were designated to be supervisors of each State's HB campaign activities. The nurses supervised staffing and scheduling of mobile teams and provided staff for expanded immunization clinic hours at central facilities. In each State, all PHNs assisted with campaign activities while continuing to manage their other programs, including immunization, hypertension treatment, family planning, and maternal-child health services. During the campaign, mobile teams carried all seven immunization program antigens on field visits. Children received routine scheduled doses, and those who were incompletely immunized received catch-up doses.

After consultation with CDC, the Government of Yap chose to immunize children through age 15 with a lower but equally effective HB dose. As the campaign progressed, Kosrae also expanded its intended immunization population to include children through age 15.

All States promoted the campaign primarily through announcements, interviews, and educational programs broadcast by radio. Posters were placed in public and private buildings, and pamphlets in local languages were distributed by public health personnel. Nurses promoted HB vaccination in waiting rooms of prenatal, postnatal, family planning, and outpatient clinics.

Immunization coverage in FSM is measured by an annual assessment conducted from January through March in each State (9). The PHN immunization coordinator examines individual growth and immunization records at the public health facilities. The record of each child born in a given year is assessed to determine how many are completely immunized with three doses of DPT, three of OPV, and one MMR dose. Subsequently, CDC's recommended two-dose MMR schedule has been implemented. The percentage of completely immunized children was determined by dividing the

Table 2. Coverage in the hepatitis B childhood vaccination campaign, by State, Federated States of Micronesia, 1988-89

Coverage	Chuuk	Kosrae	Pohnpei	Yap	All FSM
Dose 1	12,602	3,161	5,346	4,154	25,263
Dose 2	10,106	3,291	5,591	3,443	22,431
Dose 3	6,599	3,038	4,411	2,343	16,391
Expanded subject group ¹	12,090	3,806	7,589	4,474	27,959
Age group (years)	0-6	0-15	0-6	0-15	...
Percent of subject group receiving three doses ..	55	80	58	52	59

¹ Federated States of Micronesia, Department of Human Resources, Office of Health Statistics, based on the most recent State census.

Table 3. Complete immunization coverage for 2- and 6-year olds, hepatitis B childhood vaccination campaign, by State, Federated States of Micronesia, 1988-90

Area	Percent complete by age 2		Difference	Percent complete by age 2	Difference from 1989
	1988	1989		in 1990	
2-year-olds					
Chuuk.....	52	95	+ 43	95	0
Kosrae	68	78	+ 10	96	+ 18
Pohnpei	60	70	+ 10	83	+ 13
Yap.....	88	94	+ 6	96	+ 2
All FSM	67	84	+ 17	92	+ 8
6-year-olds					
Chuuk.....	52	95	+ 43	95	0
Kosrae	NR	86	...	97	+ 11
Pohnpei	61	76	+ 15	84	+ 8
Yap.....	91	98	+ 7	99	+ 1
All FSM	70	89	+ 19	94	+ 5

NOTE: Complete coverage includes 3 doses of diphtheria-pertussis-tetanus (DPT) combined vaccine, three doses of oral polio vaccine (OPV), and one dose of measles-mumps-rubella (MMR) combined vaccines. NR = No report.

total number of records for that birth year by the number complete.

Results

The number of HB vaccine doses administered to FSM newborns, children, and adolescents through age 15 years from December 1988 through October 1989 was 64,085 (9). Table 2 shows estimated subject populations, doses administered, and percent completions for three doses of HB vaccine by State.

The annual assessment results for 2- and 6-year-olds for 1988, 1989, and 1990 are shown in table 3. Complete coverage increased dramatically during these years in every State. In Chuuk, complete

coverage for 2-year-olds increased from 52 percent to 95 percent between 1988 and 1989. In Kosrae and Pohnpei, complete coverage increased 10 percent or more each year. Yap's coverage went from 88 percent in 1988 to 94 percent in 1989 and 96 percent in 1990. Similar improvement was seen for 6-year-olds.

Discussion

The primary objective of the FSM hepatitis B campaign was to reduce HBV infection in infants and HBV transmission among young children, thereby reducing morbidity and mortality of acute HBV infection and chronic liver disease and liver cancer. Eighty-two percent of FSM infants are born in the four hospitals in the component States. Postcampaign surveillance visits to the hospitals determined that newborns were routinely being given the first HB vaccine dose before discharge, therefore impeding mother-to-newborn transmission at the most critical time. As in other developing parts of the world, unlike in the United States, the technical and laboratory infrastructure in FSM was insufficient to support HB surface antigen testing of all pregnant women. Therefore, in these programs, the WHO recommendation for intervention for newborns was followed, using universal immunization.

The achievement of HB immunization of 59 percent of the subject population in a 10-month period was truly remarkable for this country having limited local resources and isolated populations. The campaign was enhanced by incorporating HB vaccination into the existing immunization schedule, adding HB vaccination to forms and records already in use, and using experienced immunization nurses as overall campaign coordinators. Experience gained from the Samoa project, where the HB campaign was separate from the ongoing immunization campaign, aided in the decision by FSM and other jurisdictions to combine HB with existing programs.

HBV infection patterns in FSM are similar to those in American Samoa, but the population of FSM is almost three times that of Samoa. Reduction of HBV infection in FSM will lead to savings in health care costs, human suffering, and premature death proportionate to those savings found in Samoa.

Accomplishment of a secondary objective was an added benefit of this campaign. The results of the annual immunization assessments demonstrate the positive impact the campaign had on overall immu-

nization coverage for FSM children. All FSM States continued the catch-up campaign for older children with purchased HB vaccine after donated vaccine was no longer available, thus raising the HB immunization rates to higher levels than those reported here.

At the annual FSM Immunization Program Coordinators' Conference held in August 1990, nurses and health educators from the four FSM States expressed their opinions about reasons for the success of the campaign. They identified five elements critical to the success of the campaign.

First, the campaign made it possible to reactivate the concept of the so-called health team, with many agencies working together to accomplish a public health goal.

Second, the immunization services were made fully available and accessible to the intended group.

Third, multiple mass media methods were used to inform the populace. Placing posters in private business establishments served to allow nurses and other health workers access to the community to inform community members about the purposes of the campaign and to gain their support.

Fourth, there was active support from recognized community leaders.

Fifth, there were strong local beliefs in the benefits of the campaign, enhancing the commitment of those who were delivering the services.

References

1. Protection against viral hepatitis: recommendations of the Immunization Practices Advisory Committee (ACIP). *MMWR* 39: 1-26, Feb. 9, 1990.
2. Tibbs, C. J.: Hepatitis B, tropical ulcers, and immunisation strategy in Kiribati. *BMJ* 294: 337-341 (1987).
3. Taylor, R.: Investigation of an epidemic of hepatitis A in Palau, January-June, 1985. South Pacific Commission, Technical Paper No. 191, Noumea, New Caledonia, November 1985.
4. Brindle, R. J., et al.: HTLV-1, HIV-1, hepatitis B and hepatitis delta in the Pacific and South-East Asia: a serological survey. *Epidemiol Inform* 100: 153-156 (1988).
5. Pacific Islands Health Officers Association: Minutes and communications, Executive Secretariat. University of Hawaii, School of Public Health, Honolulu, HI, 1988-89.
6. Federated States of Micronesia: Federated States of Micronesia digest of health statistics, Vol. 2. Department of Human Resources, Health Statistics Office, Palikir, Pohnpei, 1989.
7. Plebiscite Commission, Federated States of Micronesia: Compact of free association and related agreements between the Federated States of Micronesia and the United States of America. Kolonia, Ponape, 1982.
8. Technical assistance memorandum of understanding between the Department of the Interior, Pacific Islands

Health Officers Association, State of Hawaii Department of Health, the Regional Health Administrator of the Public Health Service, and the Centers for Disease Control, for a hepatitis B vaccination program in the U.S. Western Pacific territories and freely associated states. U.S. Department of Health and Human Services, Region IX, Office of

the Regional Health Administrator, Public Health Service, San Francisco, CA, October 1988.

9. Federated States of Micronesia, Department of Human Resources: Annual immunization assessments and quarterly immunization reports. FSM National Government, Palikir, Pohnpei, 1988-90.

Increasing Participation by Private Physicians in the EPSDT Program in Rural North Carolina

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Synopsis

This study evaluated a method to increase physicians' participation in Early and Periodic Screening, Diagnosis and Treatment (EPSDT), a preventive health care program for Medicaid eligible children. Use of EPSDT can improve children's health status and reduce health care costs. Although the potential benefits of EPSDT are clear, the program is underused; low rates of participation by private physicians contribute to underuse.

This study targeted a population of 73 primary care physicians in six rural counties in North Carolina where the physician supply, their participation in EPSDT, and use of EPSDT were low. A mailed intervention packet attempted to address barriers to participation perceived by private providers. The packet consisted of a carefully constructed letter, an informative journal article, and an educational pamphlet. Participation in EPSDT screening increased from 15 to 25 private physicians (67 percent), at a cost, on average, of less than \$30 per recruited provider. Suggestions are presented for adapting the intervention packet to other settings.

CREATED BY THE 1967 AMENDMENTS to the Social Security Act, the Early and Periodic Screening, Diagnosis and Treatment (EPSDT) Program provides comprehensive diagnostic and treatment services for Medicaid-eligible children from birth to age 21. EPSDT has been shown to improve children's health status and reduce health care costs (1-6). Though the benefits of the EPSDT Program are clear, only 31 to 37 percent of all eligible children in the United States receive EPSDT screenings (7,8). The low use of EPSDT is partially attributable to a low rate of participation in the program by private physicians (9).

Reasons for physicians' nonparticipation appear to relate to low reimbursement levels and perceived bureaucratic constraints within the Medicaid system (9-17). States have been encouraged to eliminate or reduce such barriers, and through the Omnibus Budget Reconciliation Act (OBRA) of 1989 (P.L. 101-329), have been mandated to improve use of EPSDT. In North Carolina (NC), the Division of Medical Assistance, NC's Medicaid agency, has responded by making Medicaid participation more "provider-friendly." Provider relations representatives hold orientation sessions for providers or their office personnel, offer consultation and, if re-